



PATENT

17795 (Tyco 6)

Appl. No. 10/075,406

Amdt. dated February 14, 2002

Reply to Office action of April 18, 2003

TECHNOLOGY CENTER 2800

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This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (original): A substrate for an area array package,
2 said substrate having a plurality of signal wirings, each having a first contact
3 adapted to be connected to a respective terminal of an integrated circuit, and a second
4 contact on a periphery of the substrate,
5 said substrate having a ground structure including, for each signal wiring, a pair of
6 rectangular ground plane portions located on opposite sides of the second contact of
7 that signal wiring, and
8 said substrate having a plurality of ground via holes through the substrate,
9 including at least one respective ground via hole through each rectangular ground plane
10 portion.
- 1 2. (original): The substrate according to claim 1, wherein each ground plane portion
2 has a plurality of ground via holes therethrough.
- 1 3. (original): The substrate according to claim 1, wherein for each second contact,
2 the respective ground plane portions are connected by a third ground plane portion on a
3 third side of the second contact.
- 1 4. (original): The substrate according to claim 3, wherein the third ground plane
2 portion has a plurality of ground via holes therethrough.
- 1 5. (original): The substrate according to claim 3, wherein the third ground plane
2 portions of each second contact on at least a side of the substrate are continuously
3 connected.

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1 6. (original): The substrate according to claim 1, wherein each pair of adjacent ones
2 of the second contacts have a single rectangular ground plane portion therebetween.

1 7. (original): The substrate according to claim 1, wherein the substrate has an
2 opening therethrough sized and shaped to receive the integrated circuit.

1 8. (original): An area array package comprising:

2 a substrate having:

3 a plurality of signal wirings, each having a first contact adapted to
4 be connected to a respective terminal of an integrated circuit, and a second
5 contact on a periphery of the substrate,

6 a ground structure including, for each signal wiring, a pair of
7 rectangular ground plane portions located on opposite sides of the second
8 contact of that signal wiring, and

9 a plurality of ground vias through the substrate, including at least
10 one respective ground via hole through each rectangular ground plane
11 portion;

12 a cover above the substrate, and

13 a bottom layer of the package formed of a dielectric material.

1 9. (original): The package of claim 8, further comprising an intermediate dielectric
2 layer between the bottom layer and the substrate, the intermediate dielectric layer having
3 an additional ground structure thereon.

1 10. (original): The package of claim 9, further comprising a third ground structure
2 between the bottom layer and the intermediate layer.

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1 11. (original): The package of claim 9, wherein the additional ground structure has a
2 ground opening around a signal via that is coupled to the second contact, the ground
3 opening being generally shaped like a rectangle with two mitered corners.

1 12. (original): The package of claim 8, wherein the package has a signal via beneath
2 each second contact, and a ground via beneath each ground via hole, each of the signal
3 vias and ground vias being electrically connected to a respective solder attach pad on the
4 bottom layer.

1 13. (original): The package of claim 12, wherein each signal via is surrounded on
2 three sides.

1 14. (original): The package of claim 13, wherein each signal via is surrounded by at
2 least seven ground vias.

1 15. (original): The package of claim 8, further comprising a superstrate above the
2 substrate, the superstrate generally being formed of the same material as the substrate.

1 16. (original): The package of claim 15, wherein the superstrate has an opening
2 therethrough above each second contact.

1 17. (original): The package of claim 16, wherein the opening above each second
2 contact is cylindrical and is greater in diameter than the ground vias.

1 18. (original): The package of claim 16, wherein the opening above each second
2 contact is filled with a material having a sufficiently low dielectric constant to reduce the
3 radiation from a region of the second contact significantly.

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1 19. (original): The package of claim 8, wherein the package includes a plurality of
2 pockets, each pocket shaped and sized to accommodate an integrated circuit.

1 20. (original): A printed circuit board assembly, comprising:
2 a printed circuit board having a circuit board substrate with circuit traces and a
3 plurality of devices thereon, said plurality of devices including at least one integrated
4 circuit package assembly that includes:
5 a package substrate having:
6 a plurality of signal wirings, each having a first contact adapted to
7 be connected to a respective terminal of an integrated circuit, and a second
8 contact on a periphery of the package substrate,
9 a ground structure including, for each signal wiring, a pair of
10 rectangular ground plane portions located on opposite sides of the second
11 contact of that signal wiring, and
12 a plurality of ground vias through the package substrate, including
13 at least one respective ground via hole through each rectangular ground
14 plane portion;
15 a lid above the package substrate, and
16 a bottom layer of the package formed of a dielectric material, the bottom layer
17 having a plurality of solder attach pads, electrically connected to contacts of the circuit
18 board substrate.

1 21. (original): An area array package comprising:
2 a substrate having a plurality of signal wirings, each having a first contact adapted
3 to be connected to a respective terminal of an integrated circuit, and a second contact on a
4 periphery of the substrate, the substrate having a signal via penetrating each second
5 contact;

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6 a superstrate formed of a dielectric material above the substrate, the superstrate
7 having a respective opening therethrough above each second contact;
8 a lid above the superstrate; and
9 a bottom layer of the package formed of a dielectric material.

1 22. (original): The package of claim 21, wherein the opening above each second
2 contact is cylindrical and is greater in diameter than the ground vias.

1 23. (original): The package of claim 21, wherein the superstrate is formed of the same
2 material as the substrate.

1 24. (original): The package of claim 21, wherein the substrate has a plurality of
2 ground vias therethrough, at least partially surrounding each of the signal vias.

1 25. (original): The package of claim 24, wherein the substrate has a plurality of
2 rectangular ground plane portions surrounding each of the signal vias on three sides, the
3 ground vias penetrating the ground plane portions.

1 26. (Withdrawn): A method for forming an area array package comprising the steps
2 of:

3 forming a plurality of signal wirings on a substrate, each signal wiring having a
4 first contact adapted to be connected to a respective terminal of an integrated circuit, and
5 a second contact on a periphery of the substrate, the substrate being formed of a type of
6 material suitable for use in a printed circuit board;

7 forming on a bottom layer of the area array package a plurality of solder attach
8 pads aligned with the plurality of second contacts;

9 forming a plurality of signal via holes penetrating the second contacts and solder
10 attach pads and penetrating through the substrate and the bottom layer;

11 filling the signal via holes with a conductive liquid capable of solidifying ; and

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12 solidifying the conductive liquid to form conductive signal vias.

1 27. (Withdrawn): The method of claim 26, further comprising plating the conductive
2 vias.

1 28. (Withdrawn): The method of claim 26, further comprising
2 forming ground regions on the substrate;
3 forming on the bottom layer a plurality of ground solder attach pads aligned with
4 the plurality of ground regions;
5 forming a plurality of ground via holes penetrating the ground regions and ground
6 solder attach pads and penetrating through the substrate and the bottom layer;
7 filling the ground via holes with additional conductive liquid capable of
8 solidifying ; and
9 solidifying the additional conductive liquid to form conductive ground vias.

1 29. (Withdrawn): The method of claim 26, wherein:
2 the substrate is formed of a material comprising PTFE with a ceramic filler, and
3 the bottom layer is formed of a glass reinforced hydrocarbon/ceramic laminate.

1 30. (Withdrawn): The method of claim 29, further comprising attaching a superstrate
2 above the substrate, the superstrate generally being formed of the same material as the
3 substrate.

1 31. (Withdrawn): The method of claim 29, further comprising attaching a lid above
2 the substrate, the lid being formed of FR4 or similar epoxy glass laminate.
